

IPC-615

15-slot Fault-resilient
IPC Chassis

User's Manual

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Acknowledgments

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Chapter 1 General Information

1.1 Introduction

The IPC-615 is a PC/AT-compatible computer designed for industrial applications. This rugged, all-steel chassis meets the EIA RS-310C 19" rackmount standard. The unit includes a 15-slot PC-bus compatible passive backplane and a high efficiency 300-watt switching power supply, all in a single-fan cooled chassis.

A fault detection and alarm notification system is provided in the IPC-615. It monitors its own hardware status, including temperature, cooling fans, and power (redundant power supply model only).

The IPC-615 will withstand shock, vibration, dust, and a wide range of operating temperatures in harsh industrial environments. The chassis is positively pressurized by two filtered push-pull cooling fans to exclude dust and dirt. A lockable door protects drives and switches from tampering and foreign particles.

1.2 Specifications

General

- **Construction:** Heavy-duty steel
- **Disk drive capacity:** Holds two half-height and one 3.5" disk drives. All drives are accessible from the front panel
- **Cooling system:** Two 86 CFM fans (flow-in) on the front panel, with air filter
- **Keyboard connector:** Pre-wired DIN connectors on both front and rear panels
- **Controls:** Power on/off switch, CPU reset button, alarm reset button; speaker volume control knob is protected by a lockable door
- **Status indicators:** Eight LEDs display +5 V, +12 V, -5 V, -12 V status; HDD activity; and power, fan, and temperature status
- **Speaker:** One 8-ohm, 1/4 W speaker with built-in amplifier and volume control knob
- **Dimensions (W x D x H):** 482 x 478 x 177 mm (19" x 18.8" x 7")
- **Weight:** 20 kg (44 lb)
- **Paint color:** Pantone 414U

Passive backplanes

PCA-6115

- **Slots:** 15 ISA-bus
- **PC board:** 4-layer PCB with ground and power planes for reduced noise and lower power supply impedance
- **Indicators:** LEDs for +5 V, -5 V, +12 V and -12 V

PCA-6114P4

- **Slots:** 9 ISA / 4 PCI / 1 PICMG
- **PC board:** 4-layer PCB with ground and power planes for reduced noise and lower power supply impedance
- **Indicators:** LEDs for +5 V, -5 V, +12 V and -12 V

PCA-6114P4R

- **Slots:** 9 ISA / 4 PCI / 1 PICMG
- **PC board:** 4-layer PCB with ground and power planes for reduced noise and lower power supply impedance
- **Indicators:** LEDs for +5 V, -5 V, +12 V, -12 V and +3.3 V

PCA-6114P7

- **Slots:** 6 ISA / 7 PCI / 1 PICMG
- **PC board:** 4-layer PCB with ground and power planes for reduced noise and lower power supply impedance
- **Indicators:** LEDs for +5 V, -5 V, +12 V, -12 V and +3.3 V

PCA-6114P10

- **Slots:** 3 ISA / 10 PCI / 1 PICMG
- **PC board:** 4-layer PCB with ground and power planes for reduced noise and lower power supply impedance
- **Indicators:** LEDs for +5 V, -5 V, +12 V, -12 V and +3.3 V

Power supplies

PS-300

- **Output rating:** 300 watts (max.)
- **Input voltage:** 85 ~ 130 V_{AC} or 180 ~ 264 V_{AC} @ 47 ~ 63 Hz, switchable
- **Output voltages:** +5 V @ 33 A, +12 V @ 9 A, -5 V @ 0.5 A, -12 V @ 2.5 A
- **Minimum load:** +5 V @ 1 A, +12 V @ 0.1 A
- **MTBF:** 250,000 hours @ 40° C
- **Safety:** UL/CSAI/TÜV approved

PS-310-DC48

- **Output rating:** 310 watts (max.)
- **Input voltage:** 40 ~ 60 V_{DC}
- **Output voltages:** +5 V @ 25 A, +12 V @ 10 A, -5 V @ 1 A, -12 V @ 5 A
- **Minimum load:** +5 V @ 3 A, +12 V @ 1 A
- **MTBF:** 100,000 hours at 70% load
- **Safety:** UL approved

RPS-250

- **Output rating:** 230 watts (max.) up to 30° C operating temperature
200 watts (max.) up to 40° C operating temperature
- **Input voltage:** 90 ~ 130 V_{AC} or 180 ~ 264 V_{AC} @ 47 ~ 63 Hz, switchable
- **Output voltages:** +5 V @ 25 A, +12 V @ 12 A, -5 V @ 1 A, -12 V @ 1 A
- **Minimum load:** +5 V @ 4 A, +12 V @ 1 A
- **MTBF:** 250,000 hours @ 30° C

Installation notes

The IPC-615 is designed to permit the connection of the earthed conductor of the DC supply circuit to the earthing conductor of the IPC-615's chassis.

If this connection is made, make sure that:

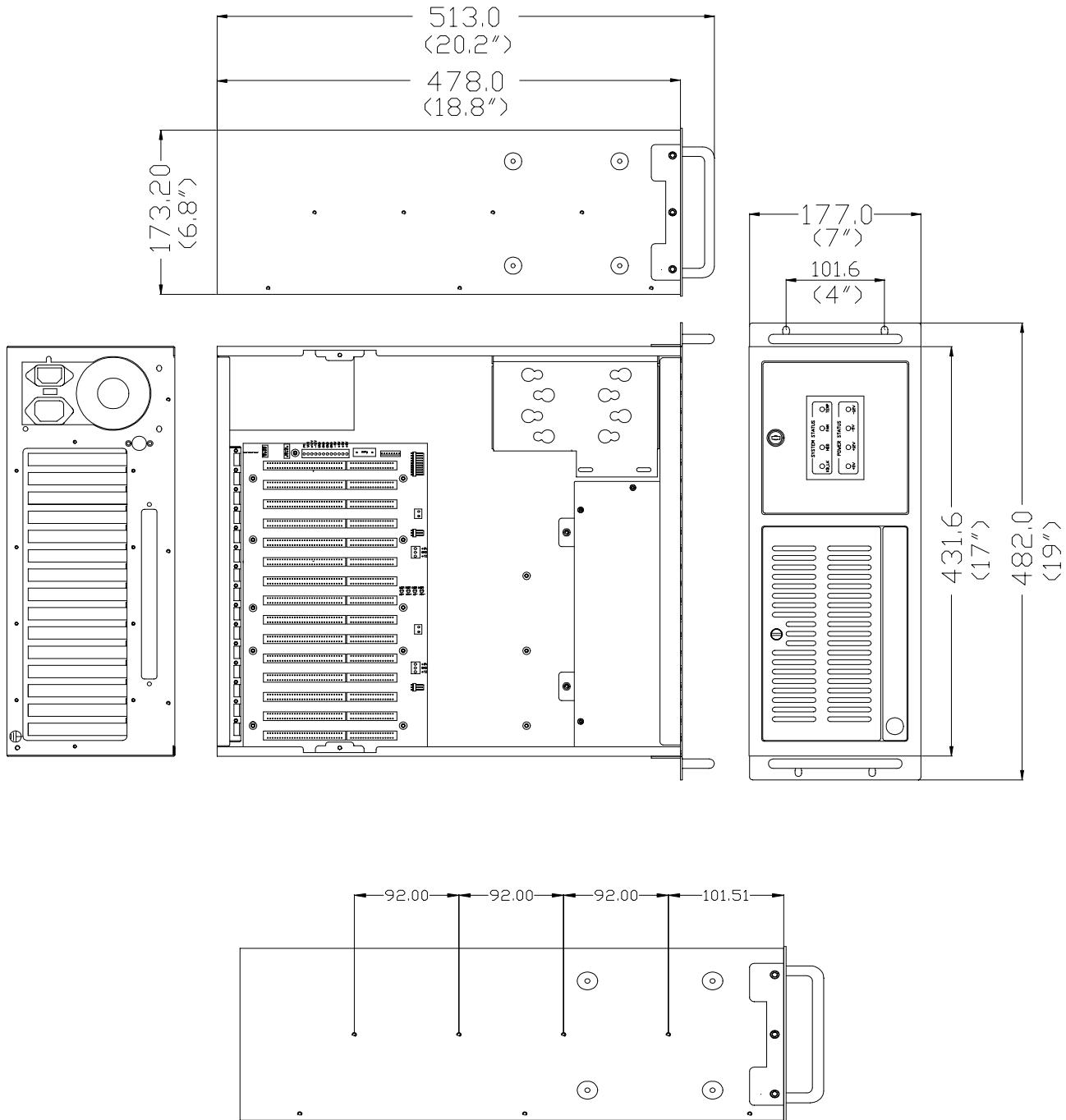
1. The IPC-615 is connected directly to the DC supply system earthing electrode conductor, or to a bonding jumper from an earthing terminal bar or bus to which the DC supply system earthing electrode conductor is connected.
2. The IPC-615 is located not only in the same immediate area (such as adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same DC supply circuit and the earthing conductor, but also in the same immediate area as the point of earthing of the DC system. The DC system must not be earthed elsewhere.
3. The DC supply source is located within the same premises as the IPC-615.
4. No switching or disconnecting device is installed in the earthed circuit conductor between the DC source and the point of connection of the earthing electrode conductor.

Warning: Due to the high wattage of the IPC-615, users must not remove the top cover of the chassis. If users need to install or remove any device in the IPC-615, they should consult qualified technical personnel.

Environmental specifications

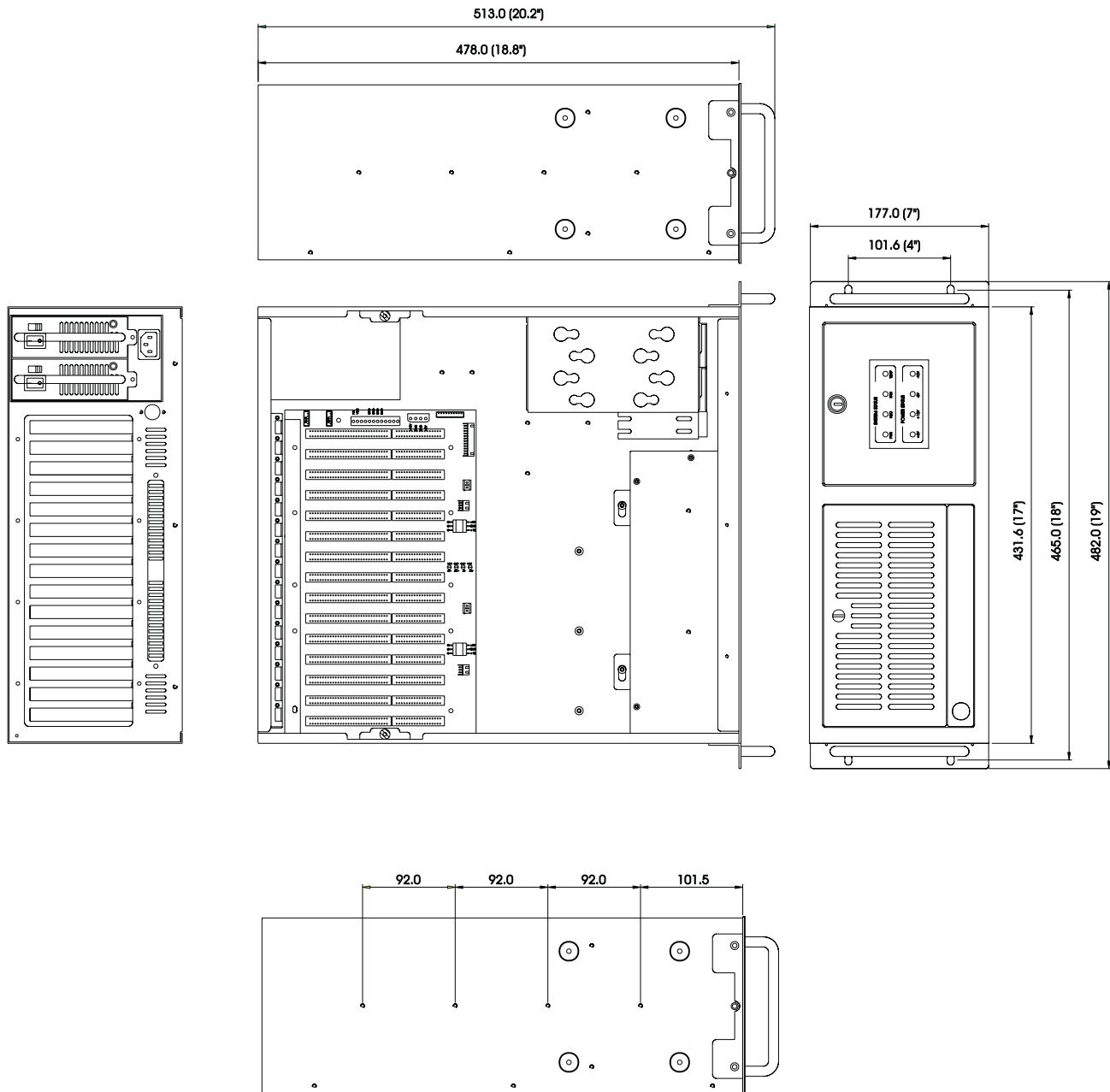
- **Operating temperature:** 0 ~ 50° C (32 ~ 122° F)
- **Relative humidity:** 10 ~ 95% @ 40°C, non-condensing
- **Vibration (operating):** 5 ~ 17 Hz, 0.1" double amplitude displacement; 17 ~ 500 Hz, 1.5 G acceleration peak to peak
- **Shock (operating):** 10 G acceleration peak (11 msec. duration)
- **Safety:** UL approved
- **EMI:** Meets FCC/VDE Class B
- **CE compliant**

1.3 Dimensions - with PS/2 power supply



Unit: mm

1.4 Dimensions - with redundant power supply



Unit: mm

Chapter 2 System Setup

Setting up your IPC-615 requires only a screwdriver and a small amount of time. Before you begin, you should also gather together all of the cards you plan to install, as well as the keyboard you plan to use.

A lockable door is located on the chassis front cover, providing access to the control panel. This offers protection and security against damage and unauthorized access. The control panel functions include power On/Off, reset switches and volume control to assist in monitoring system status. When the system detects a failure (concerning power, overheating or fans), these LED indicators will change color from green to red. There is a ground point (earthing point) located on the bottom right hand corner of the rear panel. This provides an earth for the whole system, and is attached via a screw.

Warning: *Disconnect all power from the chassis before you install the CPU cards. Unplug the power cord from the wall. Do not merely turn off the power switch. If you are not sure what to do, take the job to an experienced professional.*



2.1 Removing the cover

There are screws near the top along the sides which secure the cover to the chassis. Remove the screws, and then slide the cover to the rear of the chassis. See Figure 2-1 below:

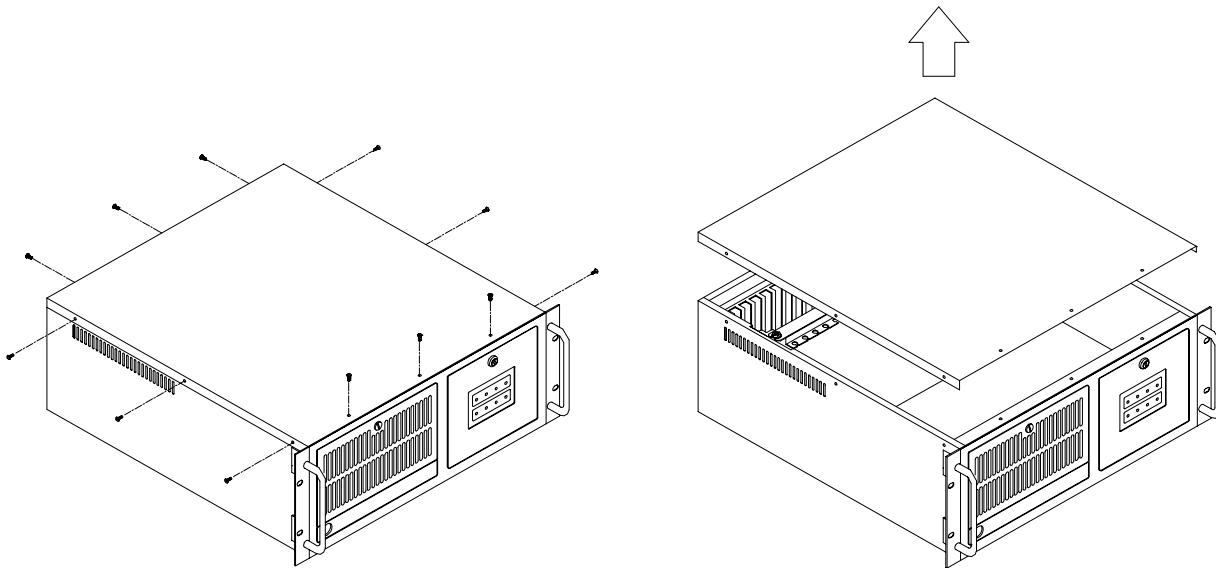


Figure 2-1: Removing the cover

2.2 Removing the handles

The handles and mounting ears for the front panel can be removed as follows:

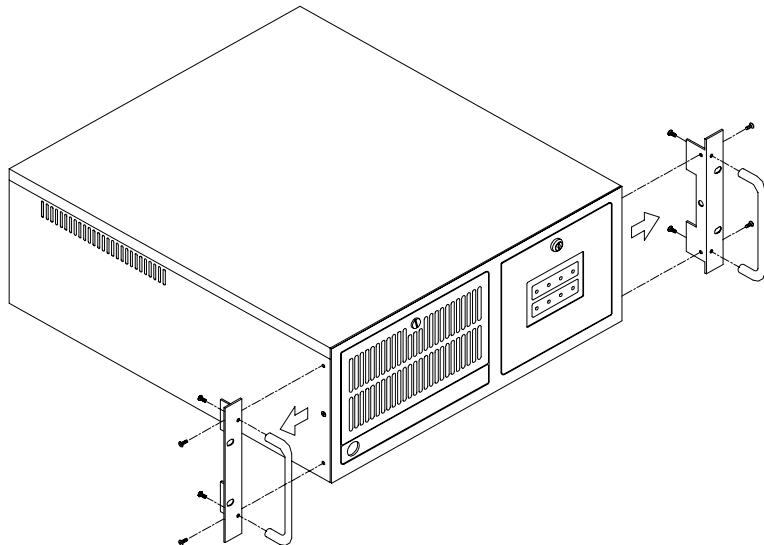


Figure 2-2: Removing the handles

2.3 Adding your disk drives

1. When facing the front panel, you will see four outer screws on the right side of the chassis. They mount the shock-resistant drive bay. Remove these screws. Slide the drive bay toward the rear, to a location where it is not obstructed by the upper rim. Lift the drive bay free of the chassis. See Figure 2-3 below.
2. Remove the front cover of the drive bay, and insert the drives into their proper locations in the drive bay. See Figure 2-4 below:

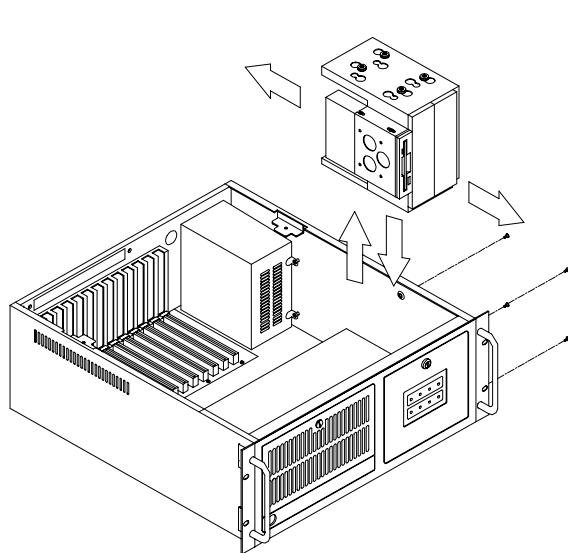


Figure 2-3: Removing the drive bay

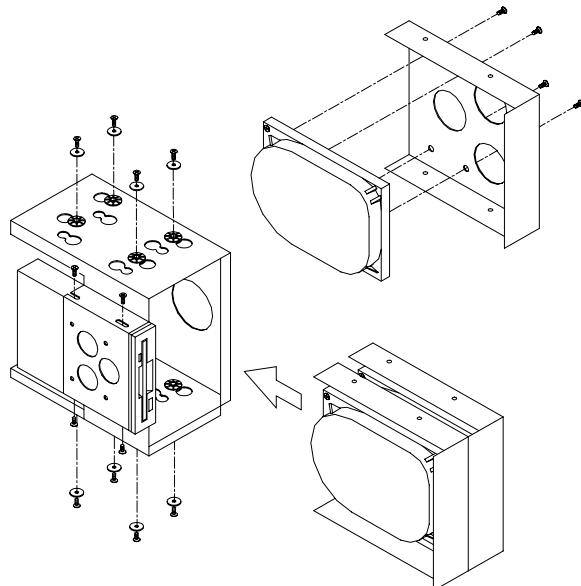


Figure 2-4: Inserting the drives into the drive bay

2.4 The hold-down clamp

The IPC-615 uses a hold-down clamp to ensure that the plug-in cards are positioned securely. It also offers protection against shock and vibration. To install your cards into the passive backplane, proceed as follows:

1. Detach the hold-down clamp by removing the two screws located at each end, and lifting it off the chassis. See Figure 2-5 below.
2. Insert the rubber buffers (provided in your kit) into the hold-down clamp. These buffers offer the plug-in cards two levels of protection against vibration. See Figure 2-6 below:

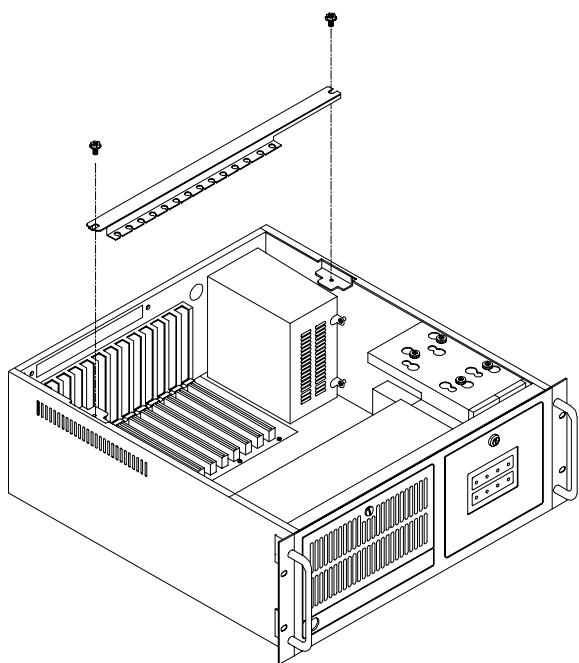


Figure 2-5: Detaching the hold-down clamp

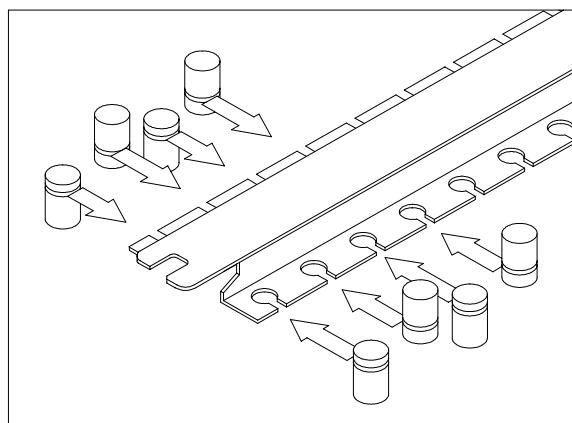
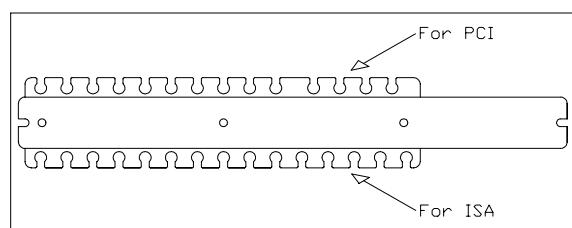


Figure 2-6: Inserting the rubber buffers

2.5 Connecting the keyboard

Two 5-pin DIN keyboard connectors, wired in parallel, are provided. One is on the front panel near the fan intake, and the other is at the rear of the chassis next to the power supply. You may connect your keyboard to either. Note that both connectors are notched for correct orientation. See Figures 2-7 and 2-8 below:

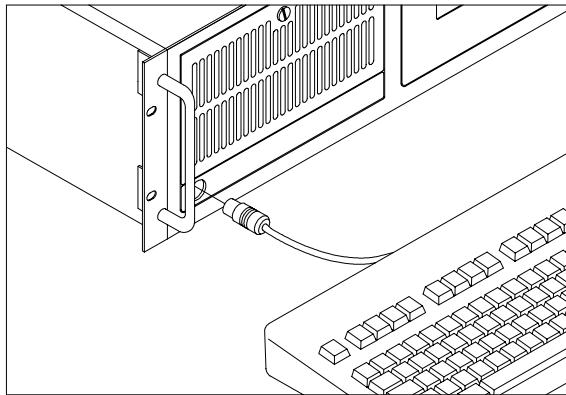


Figure 2-7: Front keyboard connection

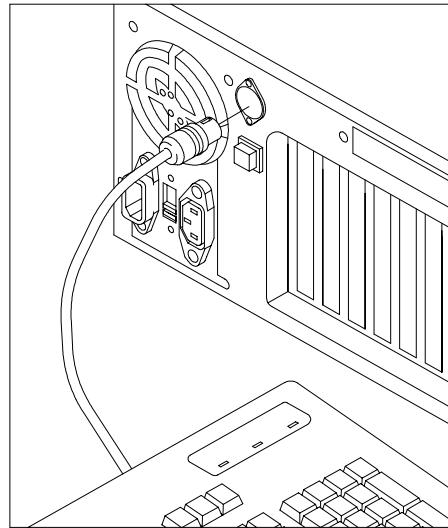


Figure 2-8: Rear keyboard connection

2.6 Replacing the filter

The filter is located on the left side of the front panel. If the IPC-615 is under continuous use, the filter should be removed about once a month. To replace the filter, open and close the door by using a coin. Refer to Figure 2-9. Take out the old filter and slide the new one into place. Refer to Figure 2-10. Then close and lock the lockable door.

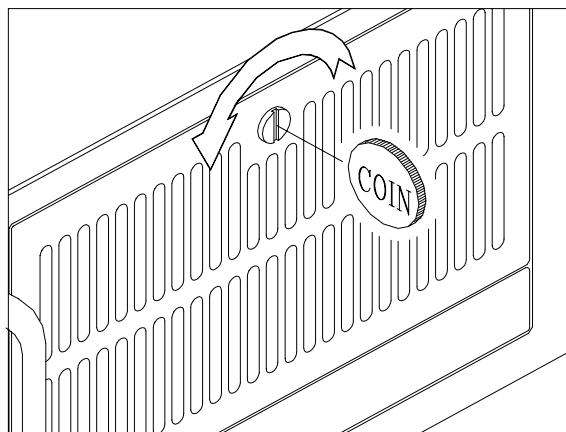


Figure 2-9: Opening/closing the door

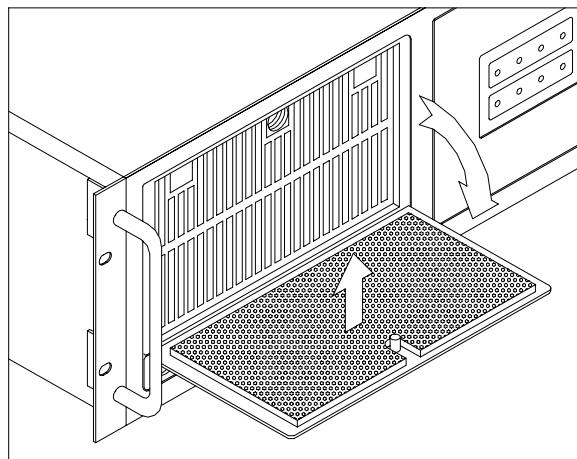


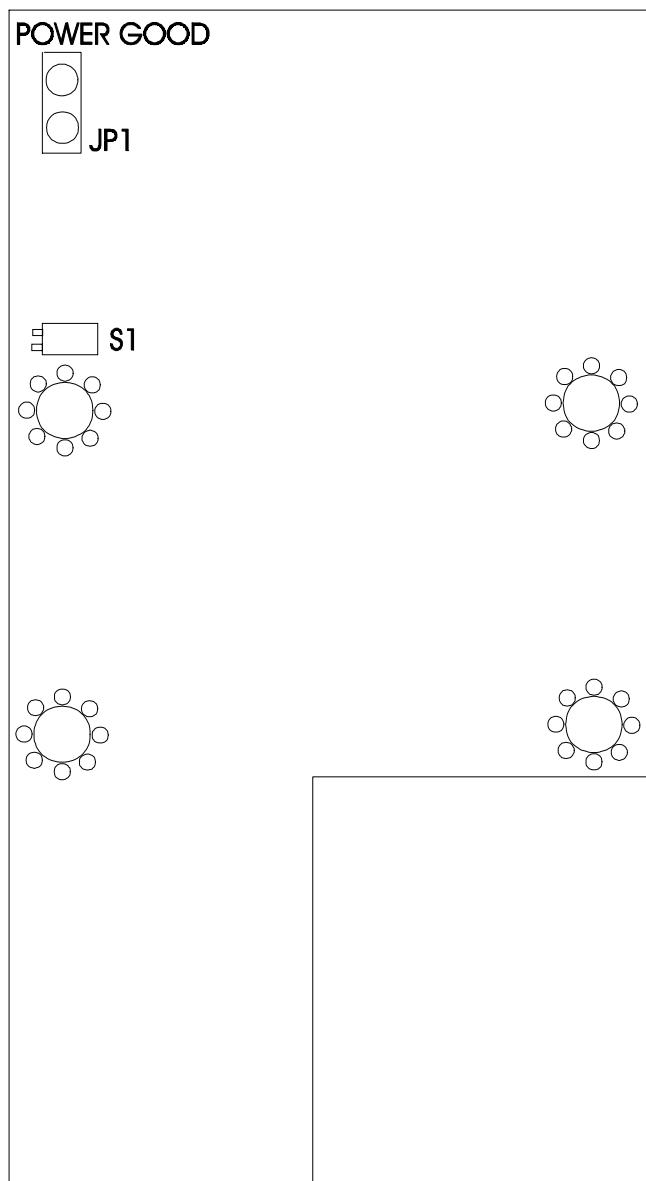
Figure 2-10: Replacing the filter

2.7 Installation of redundant power supply

Power cable connectors:

JP1 = Power good (for redundant power supply)

S1 = Threshold temperature DIP switch



S1 Switch Setup		
Pin		Threshold Temperature
1	2	
Off	On	55 C
Off	Off	65 C
On	Off	70 C
On	On	75 C

Figure 2-11: Redundant power supply connectors

Note 1: When installing a redundant power supply, the "Power Good" connector of the power supply must be connected to JP1 of the IPC-615.

Note 2: For temperature alarm setup, please refer to the "S1 Switch Setup" table above.

Chapter 3 Fault Resilient Functions

3.1 Introduction

A fault resilient IPC has a fault detection and alarm notification system. The IPC-615 monitors its own status. When a malfunction occurs, the unit alerts users of the need for maintenance.

3.2 Fault detection and alarm notification

The IPC-615 monitors system hardware for power failure, fan failure and overheating within the chassis. Fault conditions are:

Power failure: Either of the two power supplies fails

Fan failure: Either of the two cooling fans fails

Overheating: The chassis' internal temperature has reached or exceeds the user's preset maximum safe temperature

Once a problem is detected, an audible alarm activates and an LED alarm indicator (located on the front door) changes color from green to red.

3.3 Visible and audible alarms

The IPC-615 provides quick fault identification with eight front panel LED indicators displaying the system's status as follows:

Power failure (redundant power supply model only): If either of the power supplies fails, the "PWR" LED changes from green to red. You should immediately replace the malfunctioning power module with a good one.

Fan failure: If either of the two cooling fans fails, an alarm LED changes color from green to red.

Overheating: If the chassis' interior temperature reaches the user's preset maximum safe temperature (which will be either 55°, 65°, 70°, or 75° C), an alarm LED changes color from green to red. The LED remains red until the temperature returns below 65° C.

A speaker is activated at the start of a malfunction, and it will sound until the alarm reset button is pressed. However, the LED indicator will stay red until the fault condition is resolved.

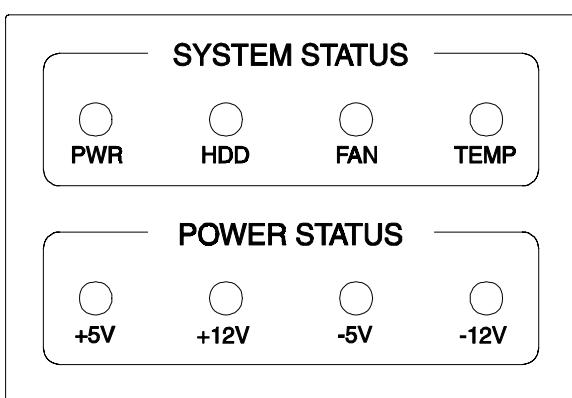


Figure 3-1: LED indicators

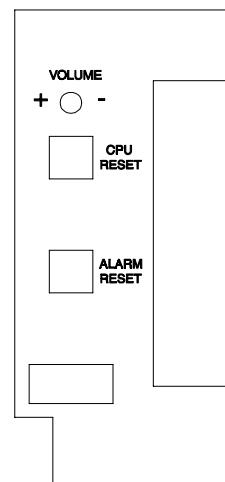


Figure 3-2: Controls

3.4 Overheating sensor

There is a small PC board called "Over Temp" installed on the left interior of the chassis. It monitors the chassis' internal temperature.

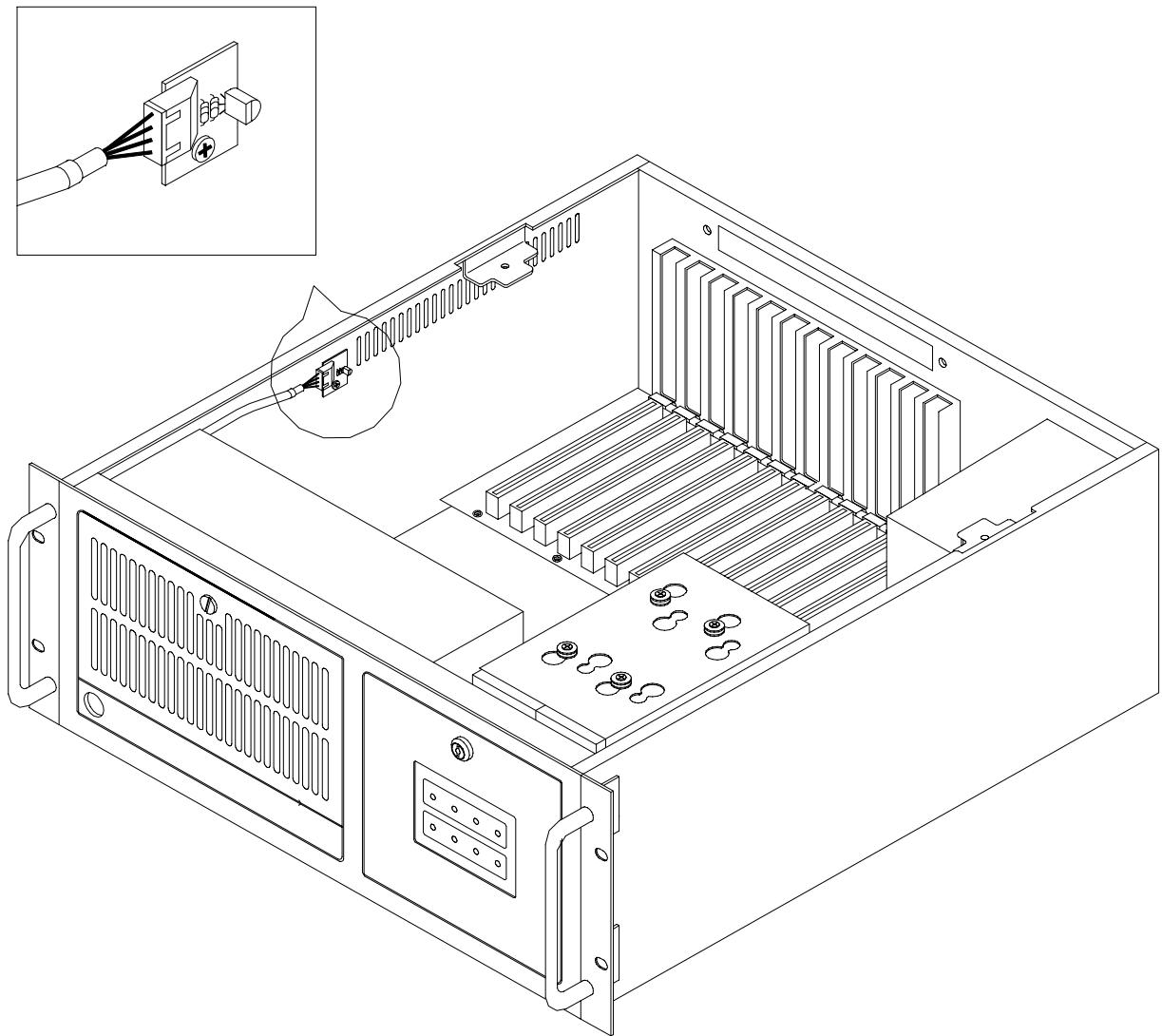
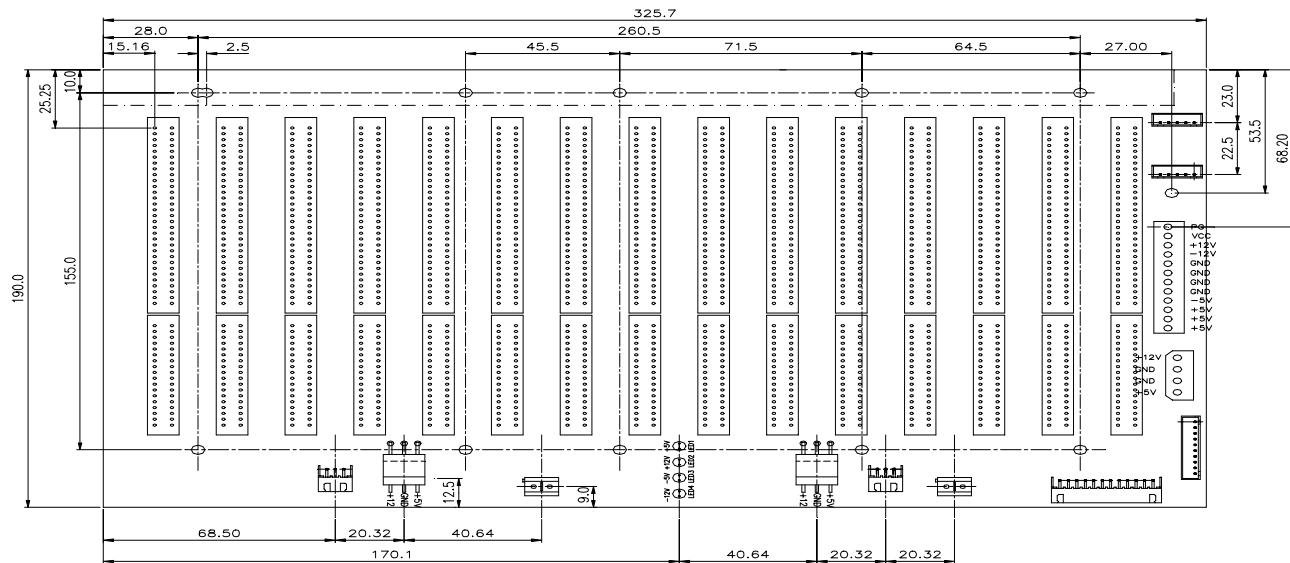


Figure 3-3: Overheating sensor

Appendix A Passive Backplanes

A.1 PCA-6115: 15-slot ISA-bus backplane

Dimensions: 316 x 175 mm



Unit: mm

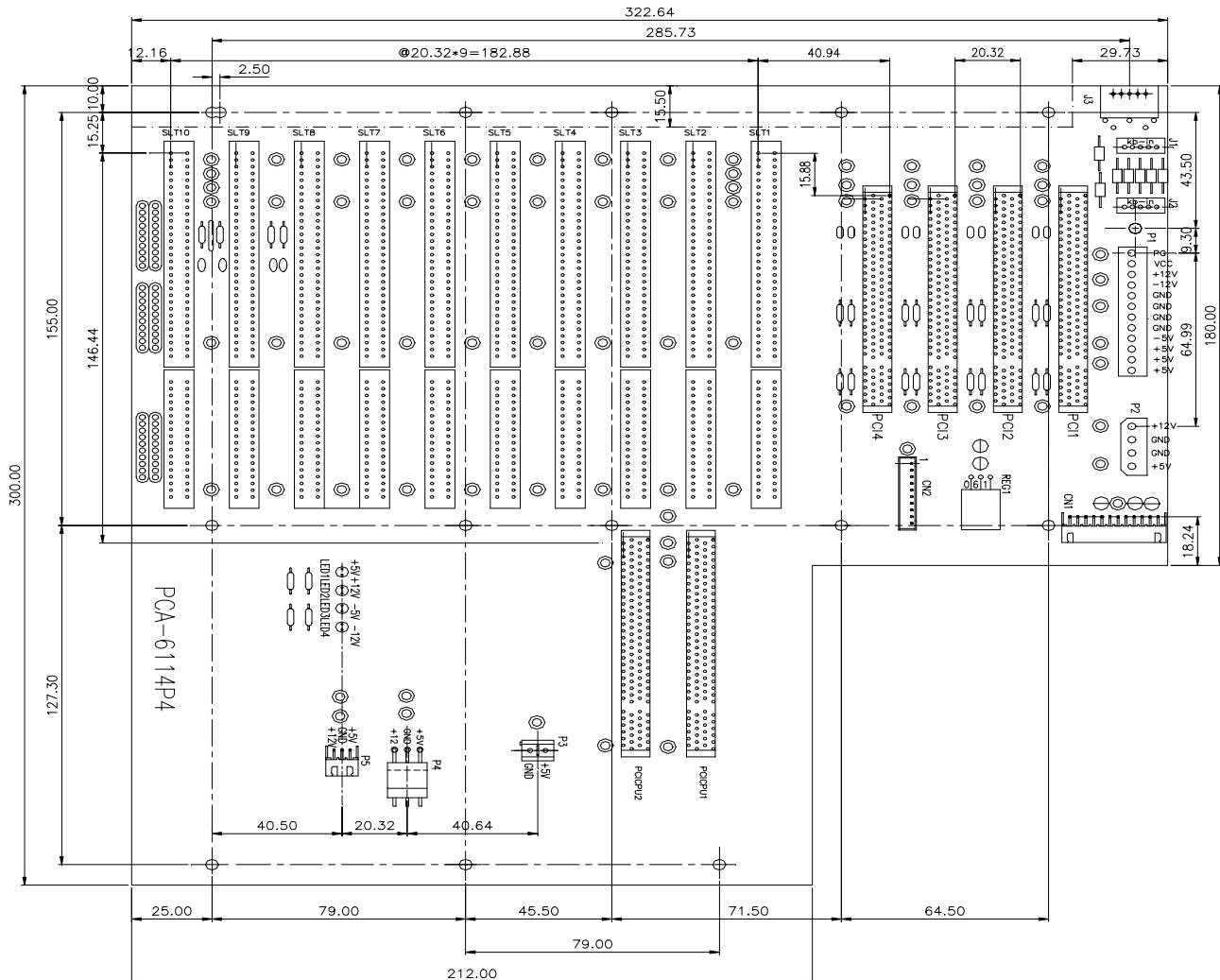
Bus Termination

Reserve sockets for NETR 10P and for termination resistors are provided.

Resistor	Signals	Resistor	Signals
RP5	SA3-SA0	RP3	SMEMW, SMEMR, IOW, IOR
RP4	SA4-SA11	RP6	SBHE, LA23-LA17
RP1	SD7-SD0	RP2	LA19-LA16
RP7	SD8-SD15		

A.2 PCA-6114P4: 9 ISA / 4 PCI / 1 PICMG-slot backplane

Dimensions: 323 x 300 mm



Unit: mm

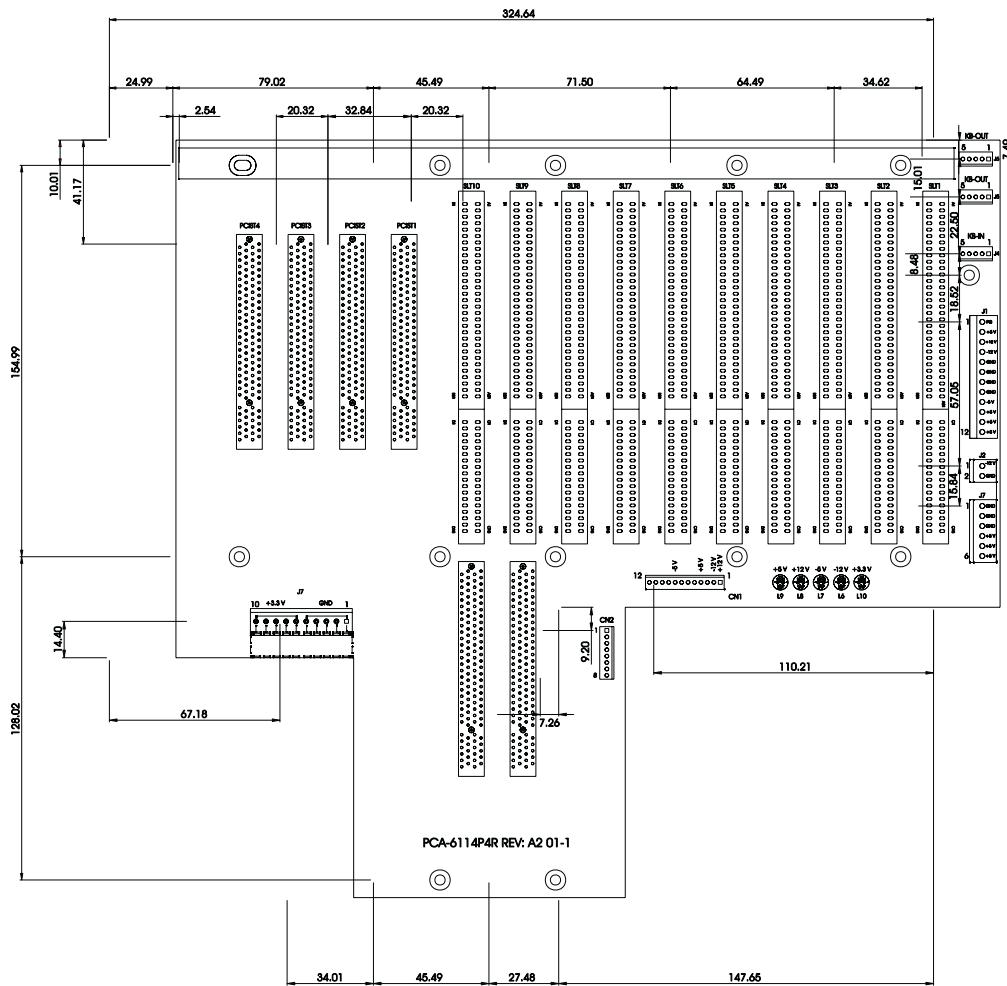
Bus Termination

Reserve sockets for NETR 10P and for termination resistors are provided.

Resistor	Signals	Resistor	Signals
RN2	SA7-SA10	RP1	SMEMW, SMEMR, IOW, IOR
RN5	SA15-SA8	RN3	SBHE, LA23-LA17
RN4	SD0-SD7	RN1	LA19-LA16
RN6	SD8-SD15		

A.3 PCA-6114P4R: 9 ISA / 4 PCI / 1 PICMG-slot backplane

Dimensions: 300 x 325 mm



Unit: mm

1. CONNECTORS

CONNECTOR	DESCRIPTION
CPCI1~2	PICMG connectors
SLT1 ~ 10	16-bit ISA-bus connectors
PCIS1 ~ 4	32-bit PCI-bus connectors (primary)
CN1	12-pin power (± 5 V, ± 12 V), SP, HDD, K/B, reset and PF connector
CN2	8-pin power (± 5 V, ± 12 V), SP, HDD and PF connector
J2	2-pin -12 V power connector
J7	10-pin +3.3 V power connector
J4	To CPU card K/B connector
J5 ~ 6	To front panel K/B connector
J7	6-pin +5 V DC power connector
P8/P9	To PS/2 power connector

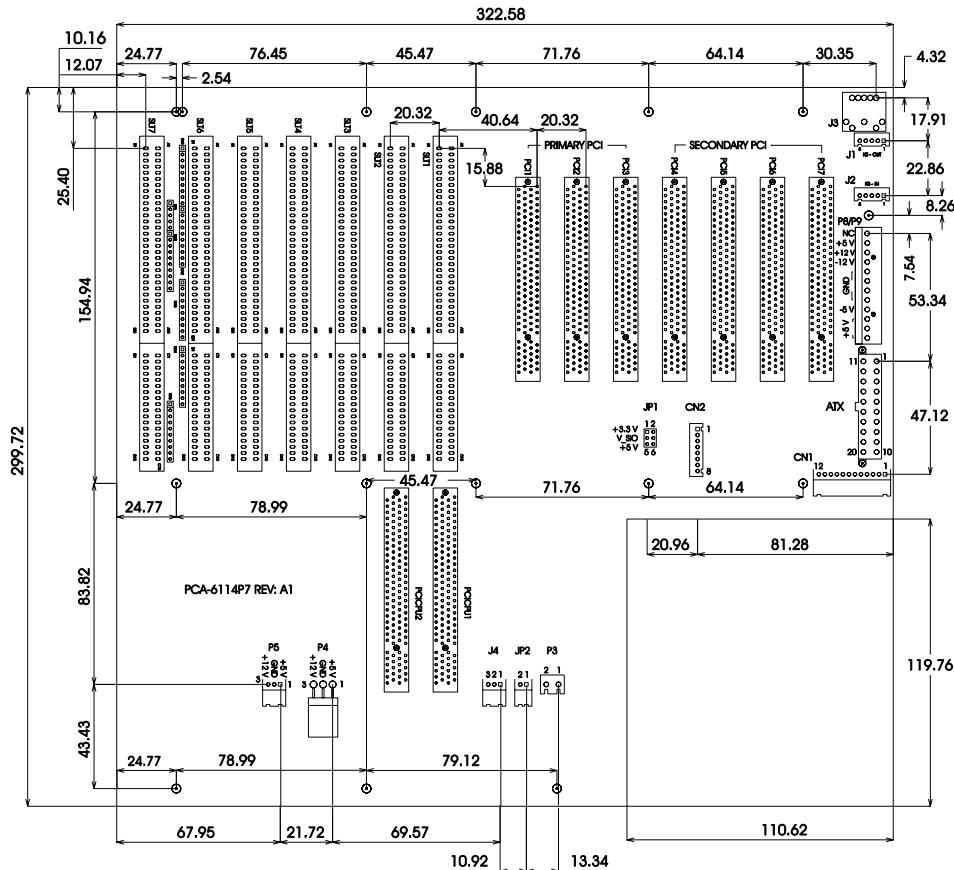
2. PIN ASSIGNMENTS

CN1	CN2	J3	P8/P9
PIN	PIN	PIN	PIN
NAME	NAME	NAME	NAME
1	SP	1	GND
2	-12 V	2	+5 V
3	SP	3	+12 V
4	+5 V	4	-12 V
5	KBDLOCK	5	GND
6	KBDDATA	6	+3.3 V
7	KBDCLK	7	+3.3 V
8	-5 V	8	+3.3 V
9	GND	9	+3.3 V
10	RESET	10	+5 V
11	HDD	11	+5 V
12	NC	12	+5 V

J4 ~ 6	J2	J7	
PIN	PIN	PIN	
NAME	NAME	NAME	
1	KBDCLK	1	GND
2	KBDDATA	2	GND
3	NC	3	GND
4	GND	4	+5 V
5	+5 V	5	+5 V
		6	+5 V

A.4 PCA-6114P7: 6 ISA / 7 PCI / 1 PICMG-slot backplane

Dimensions: 300 x 323 mm



Unit: mm

1. CONNECTORS

CONNECTOR	DESCRIPTION
SLT1 ~ 2	PICMG connectors
SLT3 ~ 7	16-bit ISA-bus connectors
PCI1 ~ 3	32-bit PCI-bus connectors (primary)
PCI4 ~ 7	32-bit PCI-bus connectors (secondary)
CN1	12-pin power (± 5 V, ± 12 V), SP, HDD, K/B, reset and P-F connector
CN2	8-pin power (± 5 V, ± 12 V), SP, HDD and P-F connector
ATX	To ATX power connector
J1 (K/B - OUT)	To front part K/B connector
J2 (K/B - IN)	To CPU card K/B connector
J3	External K/B connector
J4	To CPU card for ATX power signal
JP1	V - IO for secondary PCI bus
JP2	Power ON control for ATX power supply
P3	2-pin +5 V DC power connector
P4 ~ 5	3-pin +5 V and +12 V DC power connector
P8/P9	To PS/2 power connector

JP1	
1-3, 2-4 closed	V _{IO} = +3.3 V for secondary PCI bus
3-5, 4-6 closed	V _{IO} = +5 V for secondary PCI bus

* Default

JP2	
Closed	ATX power supply power ON
Open	ATX power supply power OFF

2. PIN ASSIGNMENTS

CN1		CN2		P4 ~ 5		P8/P9	
PIN	NAME	PIN	NAME	PIN	NAME	PIN	NAME
1	+12 V	1	SP	1	+5 V	1	NC
2	-12 V	2	+5 V	2	GND	2	+5 V
3	SP	3	KBDLOCK	3	+12 V	3	+12 V
4	+5 V	4	GND	4	-12 V	4	GND
5	KBDLOCK	5	RESET	5	NC	5	NC
6	KBDATA	6	HDD	6	+3.3 V	6	GND
7	KBDCLK	7	NC	7	+3.3 V	7	GND
8	-5 V	8	NC	8	+3.3 V	8	GND
9	GND	9	RESET	9	-5 V	9	+5 V
10	RESET	10	HDD	10	GND	10	+5 V
11	HDD	11	+5 V	11	NC	11	+5 V
12	NC	12	GND	12	NC	12	+5 V

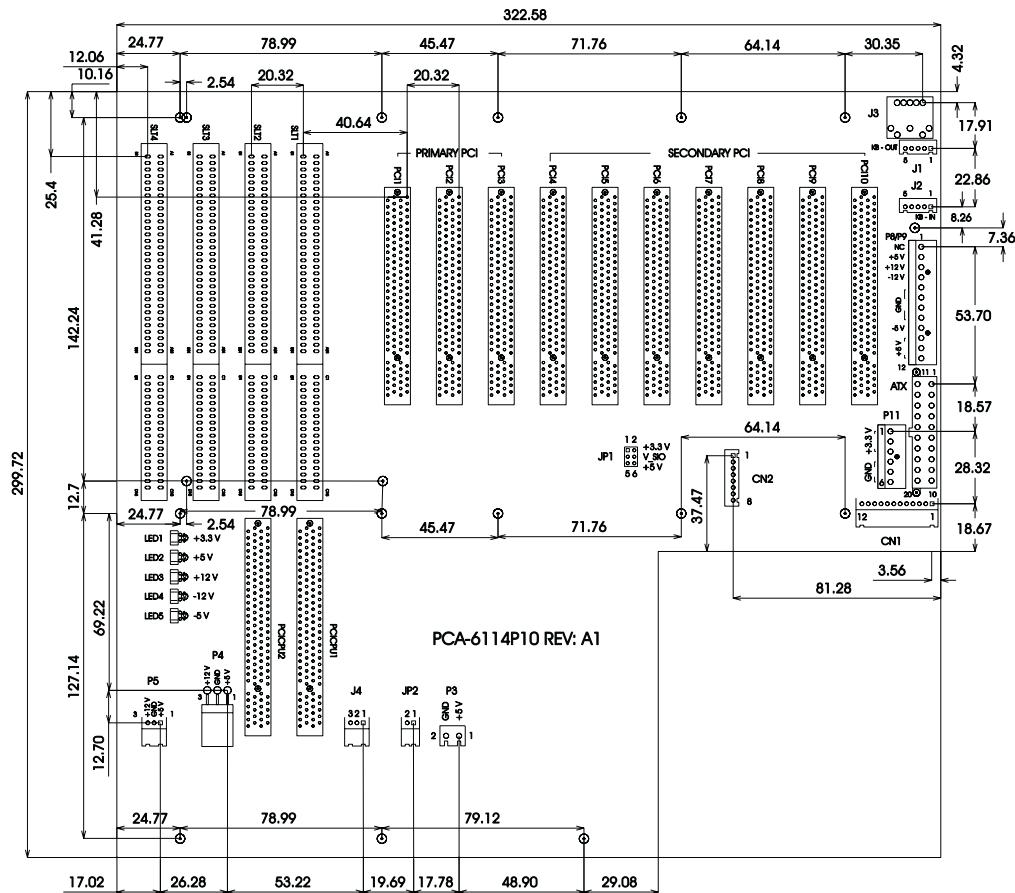
J1 ~ 3	
PIN	NAME
1	KBDCLK
2	KBDATA
3	NC
4	GND
5	+5 V

ATX	
PIN	NAME
1	+3.3 V
2	+3.3 V
3	GND
4	+5 V
5	GND
6	+5 V
7	GND
8	NC
9	5V STB
10	+12 V
11	+3.3 V
12	-12 V
13	GND
14	PS-ON
15	GND
16	GND
17	GND
18	-5 V
19	+5 V
20	+5 V

J4	
PIN	NAME
1	5V STB
2	GND
3	PS-ON

A.5 PCA-6114P10: 3 ISA / 10 PCI / 1 PICMG-slot backplane

Dimensions: 300 x 323 mm



Unit: mm

1. CONNECTORS

CONNECTOR	DESCRIPTION
SLT1 ~ 2	PCMG connectors
SLT3 ~ 4	16-bit ISA-bus connectors
PCI1 ~ 3	32-bit PCI-bus connectors (primary)
PCI4 ~ 10	32-bit PCI-bus connectors (secondary)
CN1	12-pin power (± 5 V, ± 12 V), SP, HDD, K/B, reset and P-F connector
CN2	8-pin power (± 5 V, ± 12 V), SP, HDD and P-F connector
ATX	To ATX power connector
J1 (K/B - OUT)	To front part K/B connector
J2 (K/B - IN)	To CPU card K/B connector
J3	External K/B connector
J4	To CPU card for ATX power connector
JP1	V - IO for secondary PCI bus
JP2	Power ON control for ATX power supply
P3	2-pin +5 V DC power connector
P4 ~ 5	3-pin +5 V and +12 V DC power connector
P8/P9	To PS/2 power connector
P11	6-pin +3.3 V DC power connectors

JP2	
Closed	ATX power supply power ON
Open	ATX power supply power OFF

JP1	
1-3, 2-4 closed	$V_{IO} = +3.3\text{ V}$ for secondary PCI bus
3-5, 4-6 closed	$V_{IO} = +5\text{ V}$ for secondary PCI bus

* Default

2. PIN ASSIGNMENTS

CN1		CN2		P4 ~ P5		P8/P9	
PIN	NAME	PIN	NAME	PIN	NAME	PIN	NAME
1	+12 V	1	SP	1	+5 V	1	NC
2	-12 V	2	+5 V	2	GND	2	+5 V
3	SP	3	KBDLOCK	3	+12 V	3	+12 V
4	+5 V	4	GND	4	+3.3 V	4	-12 V
5	KBDLOCK	5	GND	5	+3.3 V	5	GND
6	KBDDATA	6	RESET	6	+3.3 V	6	GND
7	KBDCLK	7	HDD	7	GND	7	GND
8	-5 V	8	NC	8	GND	8	GND
9	GND					9	-5 V
10	RESET					10	+5 V
11	HDD					11	+5 V
12	NC					12	+5 V

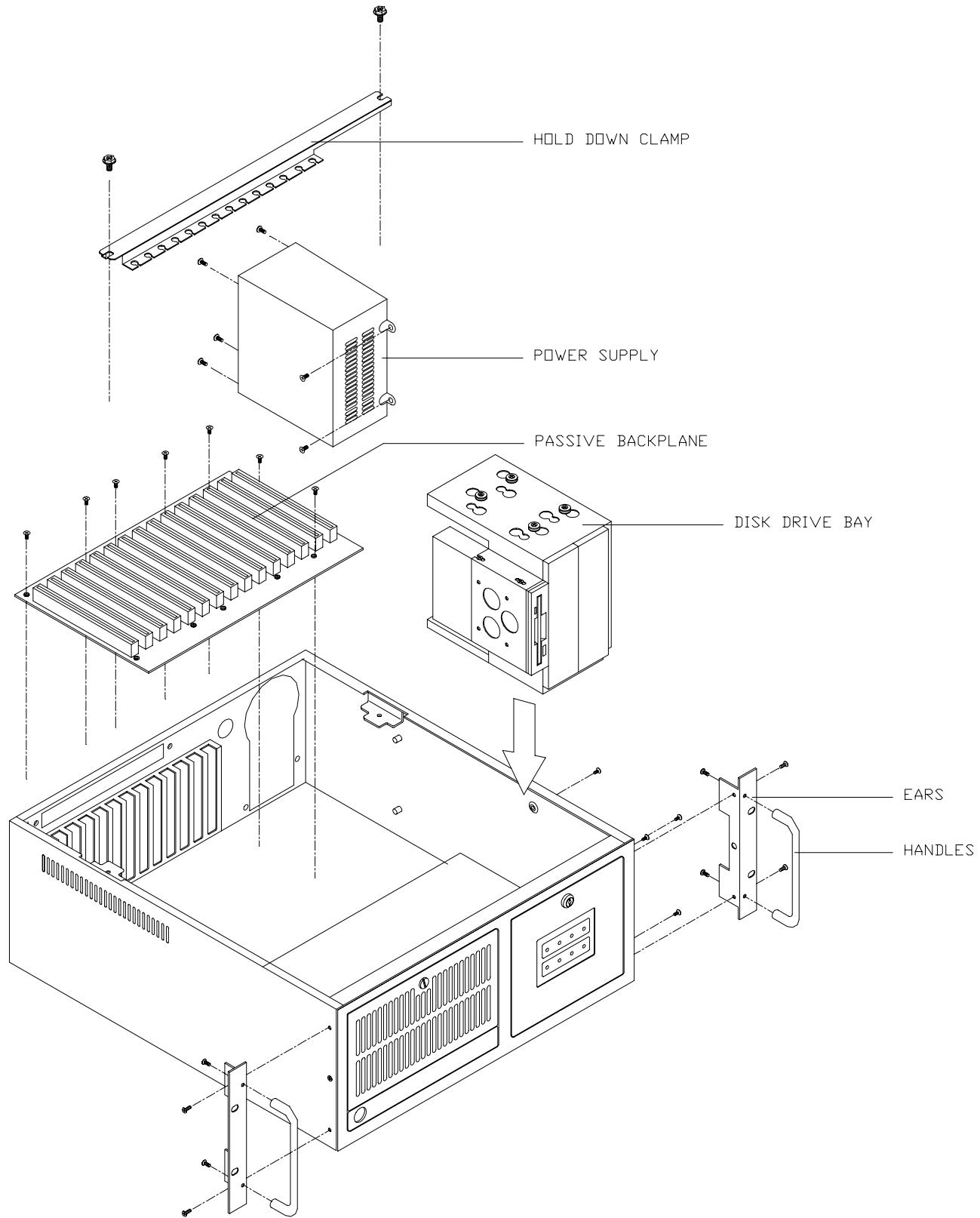
J1 ~ J3	
PIN	NAME
1	CLK
2	DATA
3	NC
4	GND
5	+5V

ATX			
PIN	NAME	PIN	NAME
1	+3.3 V	11	+3.3 V
2	+3.3 V	12	-12 V
3	GND	13	GND
4	+5 V	14	PS-ON
5	GND	15	GND

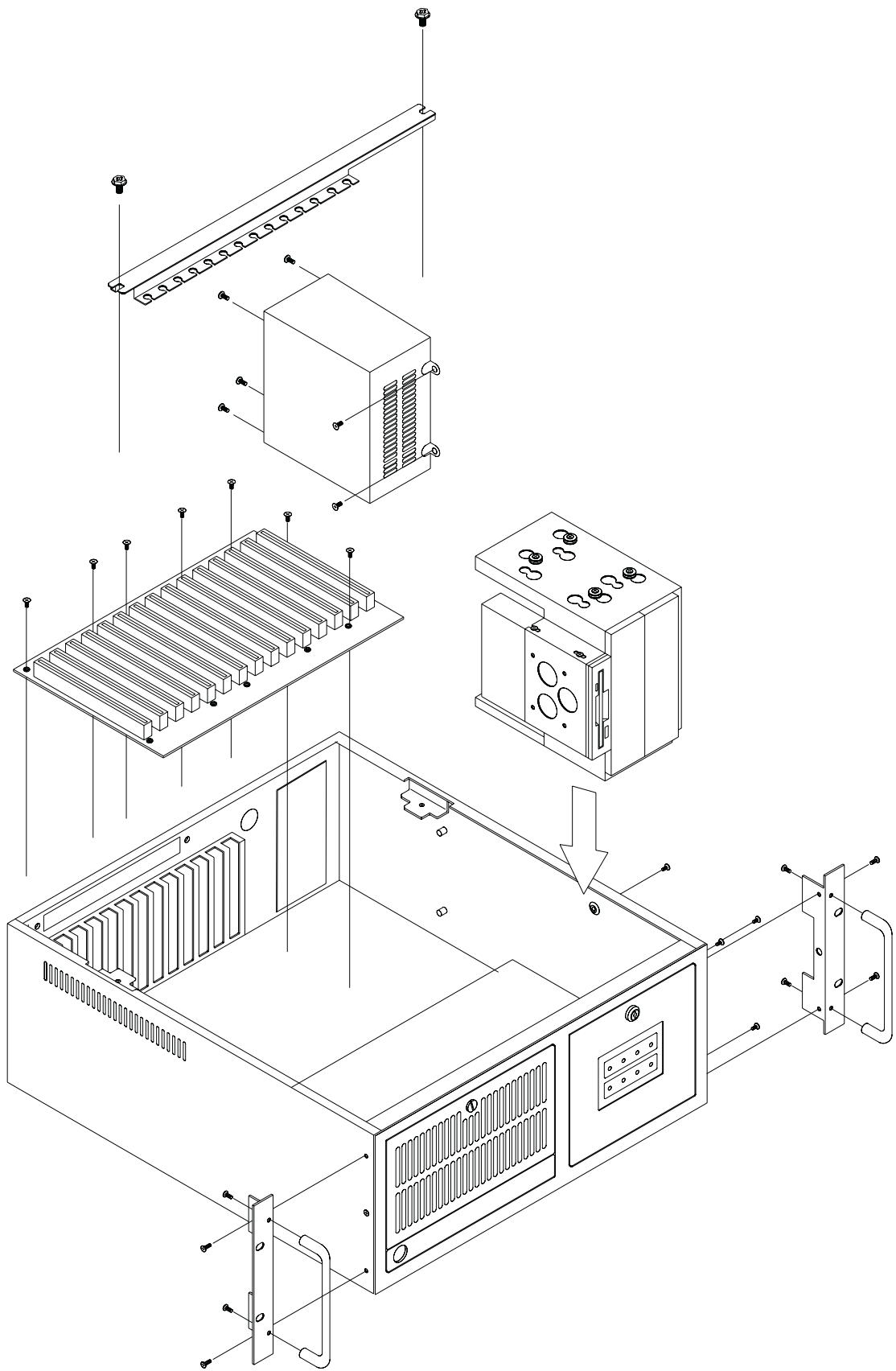
J4	
PIN	NAME
1	5 V STB
2	GND
3	PS-ON

Appendix B Exploded Diagrams

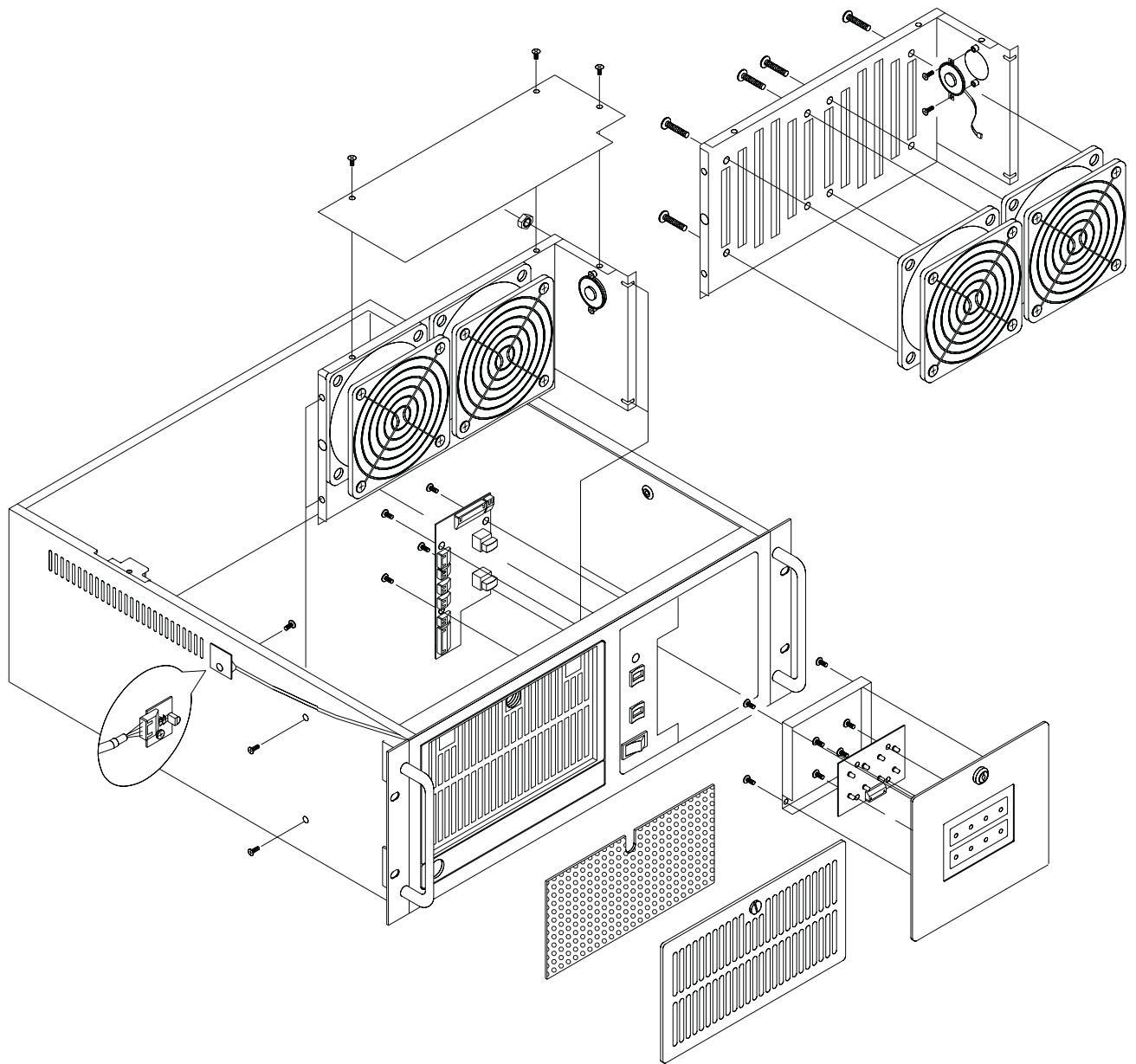
B.1 Chassis with PS/2 power supply



B.2 Chassis with redundant power supply



B.3 Chassis with other components



Appendix C Safety Instructions

C.1 English

1. Read these safety instructions carefully.
2. Keep this installation reference guide for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Do not use liquid or spray detergents for cleaning. Use a damp cloth.
4. For pluggable equipment, the power outlet must be installed near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall could cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient over-voltage.
12. Never pour any liquid into an opening. This could cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If any of the following situations arises, get the equipment checked by service personnel:
 - a. The power cord or plug is damaged.
 - b. Liquid has penetrated into the equipment.
 - c. The equipment has been exposed to moisture.
 - d. The equipment does not work well, or you cannot get it to work according to the installation reference guide.
 - e. The equipment has been dropped and damaged.
 - f. The equipment has obvious signs of breakage.
15. **DO NOT LEAVE THIS EQUIPMENT IN AN UNCONTROLLED ENVIRONMENT WHERE THE STORAGE TEMPERATURE IS BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS MAY DAMAGE THE EQUIPMENT.**

The sound pressure level at the operator's position according to IEC 704-1:1982 is equal to or less than 70 dB(A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

C.2 German - wichtige sicherheishinweise

1. Bitte lesen sie Sich diese Hinweise sorgfältig durch.
2. Heben Sie diese Anleitung für den späteren Gebrauch auf.
3. Vor jedem Reinigen ist das Gerät vom Stromnetz zu trennen. Verwenden Sie Keine Flüssig- oder Aerosolreiniger. Am besten dient ein angefeuchtetes Tuch zur Reinigung.
4. Die Netzanschlußsteckdose soll nahe dem Gerät angebracht und leicht zugänglich sein.
5. Das Gerät ist vor Feuchtigkeit zu schützen.
6. Bei der Aufstellung des Gerätes ist auf sicheren Stand zu achten. Ein Kippen oder Fallen könnte Verletzungen hervorrufen.
7. Die Belüftungsöffnungen dienen zur Luftzirkulation die das Gerät vor überhitzung schützt. Sorgen Sie dafür, daß diese Öffnungen nicht abgedeckt werden.
8. Beachten Sie beim Anschluß an das Stromnetz die Anschlußwerte.
9. Verlegen Sie die Netzanschlußleitung so, daß niemand darüber fallen kann. Es sollte auch nichts auf der Leitung abgestellt werden.
10. Alle Hinweise und Warnungen die sich am Geräten befinden sind zu beachten.
11. Wird das Gerät über einen längeren Zeitraum nicht benutzt, sollten Sie es vom Stromnetz trennen. Somit wird im Falle einer Überspannung eine Beschädigung vermieden.
12. Durch die Lüftungsöffnungen dürfen niemals Gegenstände oder Flüssigkeiten in das Gerät gelangen. Dies könnte einen Brand bzw. elektrischen Schlag auslösen.
13. Öffnen Sie niemals das Gerät. Das Gerät darf aus Gründen der elektrischen Sicherheit nur von autorisiertem Servicepersonal geöffnet werden.
14. Wenn folgende Situationen auftreten ist das Gerät vom Stromnetz zu trennen und von einer qualifizierten Servicestelle zu überprüfen:
 - a. Netzkabel oder Netzstecker sind beschädigt.
 - b. Flüssigkeit ist in das Gerät eingedrungen.
 - c. Das Gerät war Feuchtigkeit ausgesetzt.
 - d. Wenn das Gerät nicht der Bedienungsanleitung entsprechend funktioniert oder Sie mit Hilfe dieser Anleitung keine Verbesserung erzielen.
 - e. Das Gerät ist gefallen und/oder das Gehäuse ist beschädigt.
 - f. Wenn das Gerät deutliche Anzeichen eines Defektes aufweist.
15. Bitte lassen Sie das Gerät nicht unbeehert hinten unter -20° C (-4° F) oder oben 60° C (140° F), weil diesen Temperaturen das Gerät zerstören könnten.

Der arbeitsplatzbezogene Schalldruckpegel nach DIN 45 635 Teil 1000 beträgt 70dB(A) oder weiger.

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